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### Claims Listing

1 1. (currently amended) A dynamic optical router for routing optical signals  
2 to a plurality of output channels, comprising at least one frequency router having  
3 a plurality of input ports and a plurality of output ports, characterized in that  
4 each optical signal ~~contains comprising~~ destination information, at least one  
5 input port simultaneously receives at least two optical signals to be frequency  
6 routed, at least one output port simultaneously presents at least two frequency  
7 routed optical signals, and at least one output port couples routed optical signals  
8 to a plurality of output channels, wherein each optical signal to be frequency  
9 routed is dynamically tuned to a particular color in response to its destination  
10 information.

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1 2. (original) The optical router of Claim 1, further comprising:  
2 a plurality of combiners, one combiner for combining the at least  
3 two optical signals to be routed; and

4 a plurality of receivers, one receiver for separating each of the at  
5 least two routed optical signals to intended destinations in response to  
6 destination information.

1 3. (original) The optical router of Claim 2, wherein the frequency router  
2 routes optical signals by color, the at least two optical signals to be routed having  
3 different colors, and the at least two routed optical signals having different  
4 colors.

1 4. (original) The optical router of Claim 3, wherein the optical router  
2 receives packets of data, each packet of data having destination information, each  
3 combiner coupled with at least one converter of a plurality, each converter  
4 converting at least one packet of data to an optical signal colored in response to  
5 the destination information of the corresponding at least one packet of data.

1 5. (previously presented) The optical router of Claim 4, wherein the  
2 frequency router comprises:

3 at least one input waveguide;

4 at least one output waveguide;

5 a first and a second free space region, the first free space region  
6 coupled with the at least one input waveguide and the second free space  
7 region coupled with the at least one output waveguide; and

8 an optical grating having a plurality of unequal length waveguides,  
9 each unequal length waveguide coupled between the first free space  
10 region and the second free space region.

1 6. (original) The optical router of Claim 5, wherein each receiver comprises:

2 at least two tunable filters; and

3 at least one splitter for splitting the at least two routed optical  
4 signals between the at least two tunable filters such that at least one of the

5 at least two tunable filters is tuned to pass one of the at least two routed  
6 optical signals to an intended destination.

1 7. (original) The optical router of Claim 5, wherein each receiver comprises:

2 at least two second stage converters;

3 at least one demultiplexer for separating each of the at least two  
4 routed optical signals into one of the at least two second stage converters,  
5 each second stage converter converting one of the routed optical signals to  
6 a second stage optical signal colored in response to the destination  
7 information of the corresponding at least one packet of data; and

8 at least one second stage combiner for combining second stage  
9 optical signals into a combined second stage optical signal to be frequency  
10 routed.

1 8. (original) The optical router of Claim 7, further comprising:

2 a second stage frequency router having a plurality of second stage  
3 input ports and a plurality of second stage output ports, one second stage  
4 input port receiving the combined second stage optical signal to be  
5 frequency routed; and

6 a plurality of output stage demultiplexers, each output stage  
7 demultiplexer being coupled one second stage output port of the second  
8 stage frequency router such that each second stage optical signal of the

9 combined routed second stage optical signal is presented to an intended  
10 destination.

1 9. (currently amended) A dynamic optical router for routing a plurality of  
2 packets, N, of data to a plurality of output channels, each packet of data having  
3 destination information, the optical router comprising:

4 a plurality of converters, each converter receiving a packet of data  
5 and providing an optical signal to be combined and routed, each optical  
6 signal being colored in response to the destination information of the  
7 respective packet of data;

8 a plurality of combiners, one combiner combining at least two  
9 optical signals to be routed; characterized by:

10 at least one frequency router having a plurality of input ports, M,  
11 and a plurality of output ports, M, at least one output port simultaneously  
12 receiving the at least two optical signals to be routed, at least one output  
13 port simultaneously presenting at least two routed optical signals, and at  
14 least one output port coupling routed optical signals to a plurality of  
15 output channels, the at least one frequency router routing optical signals  
16 by color dynamically in response to said destination information;

17  
18 a plurality of receivers having a plurality of outputs corresponding  
19 to said output channels, which in turn correspond to intended  
20 destinations; and

21 a plurality of splitters, one splitter splitting the at least two routed  
22 optical signals along separate optical paths toward at least two output

23 channels, a receiver in one of the paths being tuned to pass one of the at  
24 least two routed optical signals to an intended destination.

1 10. (original) The optical router of Claim 9, wherein each converter comprise  
2 a tunable light source for generating one optical signal, and for coloring the one  
3 optical signal in response to the destination information of the respective packet  
4 of data, and wherein each receiver comprises a tunable filter for tuning to a color  
5 to pass one of the at least two routed optical signals to an intended destination.

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1 11. (original) The optical router of Claim 10, wherein each converter  
2 comprises a converter for converting at least one packet of data to the one optical  
3 signal colored in response to destination information, and wherein each receiver  
4 comprises a converter for converting a routed optical signal into a routed packet  
5 of data.

1 12. (original) The optical router of Claim 11, further comprising a scheduler  
2 for scheduling the conversion each packet of data into an optical signal and for  
3 scheduling the tuning of the tunable filter.

1 13. (previously presented) The optical router of Claim 11, wherein the  
2 frequency router comprises:

3 at least one input waveguide;

4 at least one output waveguide;

5 a first and a second free space region, the first free space region  
6 coupled with the at least one input waveguide and the second free space  
7 region coupled with the at least one output waveguide; and

8 an optical grating having a plurality of unequal length waveguides,  
9 each unequal length waveguide coupled between the first free space  
10 region and the second free space region.

1 **14. (currently amended)** A dynamic optical router for routing a plurality of  
2 packets, N, of data to a plurality of output channels, each packet of data having  
3 destination information, the optical router comprising:

4 a plurality of first stage converters, each converter receiving a  
5 packet of data and providing an optical signal to be combined and routed,  
6 each optical signal being colored in response to the destination  
7 information of the respective packet of data;

8 a plurality of first stage combiners, one combiner combining at least  
9 two optical signals to be routed; ~~characterized by:~~

10 a first stage frequency router having a plurality of input ports, M,  
11 and a plurality of output ports, M, at least one input port simultaneously  
12 receiving the combined at least two optical signals to be routed, at least  
13 one output port simultaneously presenting at least two first stage routed  
14 optical signals and at least one output port coupling routed optical signals  
15 to a plurality of output channels, the first stage frequency router routing  
16 optical signals by color dynamically in response to said destination  
17 information;

18 a plurality of second stage converters, each second stage converter  
19 providing a second stage optical signal to be combined and routed, each  
20 second stage optical signal being colored in response to the destination  
21 information of the respective packet of data; and each second stage  
22 converter including a buffer that delays selected packets based on the  
23 destination information;

24 a plurality of second stage demultiplexers, one second stage  
25 demultiplexer presenting each of the at least two routed optical signals  
26 from the first stage frequency router to a second stage converter;

27 a plurality of second stage combiners, one second stage combiner  
28 combining at least two second stage optical signals to be routed; and

29 a second stage frequency router having a plurality of second stage  
30 input ports, M, and a plurality of second stage output ports, M, at least  
31 one second stage input port simultaneously receiving at least two second  
32 stage optical signals to be routed, at least one second stage output port  
33 simultaneously presenting at least two second stage routed optical signals,  
34 and at least one output port coupling routed optical signals to a plurality  
35 of output channels, the second stage frequency router routing second  
36 stage optical signals by color dynamically in response to said destination  
37 information.

1 15. (original) The optical router of Claim 14, further comprising a plurality of  
2 output stage receivers, each output stage receiver having an output stage  
3 demultiplexer, one output stage demultiplexer presenting each of the at least two

4 second stage routed optical signals from the second stage frequency router to an  
5 intended destination.

1 16. (original) The optical router of Claim 14, further comprising a plurality of  
2 output stage receivers, each output stage receiver comprising:

3 at least two tunable filters for tuning to a color; and

4 a splitter coupled with the at least two tunable filters, wherein one  
5 output stage receiver splits the at least two second stage routed optical  
6 signals between the corresponding at least two tunable filters such that at  
7 least one of the at least two tunable filters is tuned to pass one of the at  
8 least two second stage routed optical signals to an intended destination.

1 17. (original) The optical router of Claim 14, wherein each first stage  
2 converter comprises a first stage tunable light source for generating one optical  
3 signal, and for coloring the one optical signal in response to the destination  
4 information of the respective packet of data, each second stage converter  
5 comprises a second stage tunable light source for generating one second stage  
6 optical signal, and for coloring the one second stage optical signal in response to  
7 the destination information of the respective packet of data, and further  
8 comprising a scheduler for scheduling the coloring of each optical signal and  
9 each second stage optical signal.

1 18. (original) The optical router of Claim 17, wherein each first stage  
2 converter comprises a first stage converter for converting at least one packet of  
3 data to the one optical signal colored in response to destination information of

4 the respective packet of data, each second stage converter comprises a second  
5 stage converter for coloring one second stage optical signal in response to  
6 destination information of the respective packet of data.

1 19. (original) The optical router of Claim 14, wherein at least one of the first  
2 and the second stage frequency routers comprise:

3 at least one input waveguide;

4 at least one output waveguide;

5 a first and a second free space region, the first free space region  
6 coupled with the at least one input waveguide and the second free space  
7 region coupled with the at least one output waveguide; and

8 an optical grating having a plurality of unequal length waveguides,  
9 each unequal length waveguide coupled between the first free space  
10 region and the second free space region.

1 20. (previously presented) The optical router of Claim 14, wherein each  
2 second stage converter, in response to destination information, re-colors the  
3 optical signals that are received thereby.

1 21. (currently amended) A method for routing optical signals to a plurality of  
2 output channels comprising:

3 determining a first, second and third destination for a first, second

4 and third packet of data, respectively;

5 generating a first, second and third carrier signal having a first,  
6 second and third frequency associated with the first, second and third  
7 destinations, respectively;

8 modulating the first, second and third carrier signals in response to  
9 the first, second and third packets of data to form a first, second and third  
10 optical signal; and

11 routing the first, second and third optical signals by a frequency  
12 routing device, the step of routing comprising characterized by:

13 simultaneously receiving in a first input of a frequency  
14 router at least two of the first, second and third signals;

15 simultaneously presenting from a first output of the  
16 frequency router at least two of the first, second and third routed  
17 optical signals; and coupling routed optical signals from at least  
18 one output port to a plurality of output channels.

1 22. (currently amended) A method for routing a plurality of optical signals to  
2 a plurality of output channels as a function of color through a router having a  
3 plurality of input ports and a plurality of output ports, the method comprising  
4 characterized by the steps of:

5 simultaneously receiving at at least one of the input ports at least  
6 two optical signals respectively colored as a function of destination information  
7 contained therein;

1 simultaneously presenting to at least one of the output ports at least  
2 two optical signals routed as a function of their color; and coupling routed  
3 optical signals from at least one output port to a plurality of output channels.

1 23. (previously presented) The method of claim 22, after the presenting step  
2 further comprising the step of processing each of the presented at least two  
3 routed optical signals from the at least one of the output ports.

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1 24. (previously presented) The method of claim 22, further comprising the  
2 step of coloring each optical signal of the plurality as a further function of which  
3 input port of the plurality of input ports it is applied to.

1 25. (original) A method for use in conjunction with a router which has a  
2 plurality of input ports and plurality of output ports, said router being of a type  
3 which routes optical signals applied to its input ports to particular ones of said  
4 output ports as a function of the respective colors of said optical signals, the  
5 method:  
6 applying each of a plurality of optical signals to a respective one of the  
7 input ports, this including the step of concurrently applying to an  
8 individual one of said input ports at least two optical signals which have  
9 been respectively colored as a function of destination information  
10 contained in said optical signals, at least two of said optical signals being  
11 concurrently routed to a particular one of said output ports.

1 26. (original) The invention of claim 25, comprising the further step of

2 concurrently removing from said particular one of said output ports said two  
3 optical signals concurrently routed thereto.

1 27. (original) The invention of claim 25, wherein the coloring of each said  
2 optical signal is a further function of which input port it is applied to.

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